

Response to DOE General Comments

DOE G-1.

Comment Our first major concern with the document is that the site descriptions in Section 2.1 indicate that all Individual Hazardous Substance Sites (IHSS's) in OU 2 (with the possible exceptions of the Reactive Metal Destruction Site, the Gas Detoxification Site and the East Spray Irrigation Sites) have had the surface soil removed or covered with asphalt or clean soil. If these descriptions are correct, it would appear that there is no major source of contaminants to be released via the postulated surface soil-related release mechanisms. There may be no complete exposure pathways associated with surface soils. Please discuss this issue further.

Response The extent of clean-up of the areas discussed in Section 2.1 was not risk based. Therefore, sampling of these areas will determine whether any remaining contamination poses a potential health risk.

DOE G-2:

Comment Our other major concern is that this document assumes the source areas for contaminated surface soil are the IHSS's. The surface soil sampling proposed in Technical Memorandum (TM) Number (No) 7 (January 1993) for this OU specifies only 6 samples in the IHSS's, 2 in the 903 Pad Area, 2 in the Mound, and 2 in the East Trenches. If surface soil contamination does exist, the analytical results from these 6 samples are unlikely to be adequate for risk assessment or for the contaminant transport modeling proposed, especially given the disparate disposal histories of these IHSS's. TM No 7 also recommends reconnaissance sampling of an area of about 1 square mile east of the IHSS's.

It is unclear how these samples would be used in this Risk Assessment. Recommend that there be more coordination between actual Risk Assessment needs and proposed sampling.

Response The surface soil sampling plan was designed to address OU 2 wide surface soil contamination. Based on the fact that the IHSSs have been cleaned-up to some extent and remaining surface soil contamination has likely dispersed over time, a more uniform pattern of contamination would be expected.

DOE G-3:

Comment Throughout the document, exposure pathways and exposure routes are stated to be significant or insignificant. The decision on the significance of most pathways should be made based on the results of the Risk Assessment. Recommend that exposure pathways simply be designated as complete or incomplete in this document.

Response Agreed. EPA's Risk Assessment Guidance for Superfund (Part A, Section 3.5) states that a human health evaluation "should be limited to the complexity and level of detail necessary to adequately assess risks." The relative significance of pathways is typically known from experience and is used to ensure that driving pathways are addressed quantitatively and that unnecessary calculations are not made.

The purpose of the designations was to eliminate incomplete exposure pathways from the risk assessment, to qualitatively address negligible pathways, and to quantitatively evaluate significant or insignificant pathways.

Response to DOE Specific Comments

DOE S-1. Section 1.2, page (p) 1-2, first paragraph

Comment This paragraph classifies exposure scenarios as significant, insignificant or negligible. However, Section 3.4 classifies scenarios as improbable, plausible or credible. Section 4.5 applies the significant, insignificant or negligible terminology to exposure pathways and routes. Recommend that

this type of terminology be dropped altogether or at least that consistent terminology be used to describe exposure scenarios.

Response Consistent terminology will be used in the revised technical memorandum in Sections 1 and 4. The discussions in Section 3 will differ and simply describe potential future land uses as credible or improbable. The following illustrates this terminology for future land uses.

For the purpose of a qualitative evaluation of potential receptors, future land-use scenarios have been categorized as either improbable (unlikely to occur because of serious constraints) or credible (expected to occur given the right set of circumstances). Table 3-3 presents the probability classification for the five major future land use categories (residential, commercial/industrial, recreational, ecological reserve, and agricultural).

Future land uses considered to be improbable include on-site residential, on-site agriculture, off-site agricultural, and off-site ecological reserve. Both on-site agriculture and on-site residential are considered improbable because of the increasing public interest in preserving unplowed prairie and wetland habitats and protecting wildlife. This is evidenced by ongoing acquisition of open space by Jefferson County, Boulder County, and the City of Boulder (including large tracts near RFP) and the recent designation of the Rocky Mountain Arsenal as a wildlife refuge by the U.S. Fish and Wildlife Service. Like RFP, the Arsenal is a large (27-square mile) RCRA/CERCLA site that was protected from grazing or development because of weapons production and the need for an extensive buffer zone. Additionally, agriculture would offer poor economics compared to commercial/industrial development.

Off-site agriculture is considered to be less likely than residential, commercial/industrial, or recreational uses because of economics as well as increasing public and community interest in preserving open space. This is also consistent with existing regional zoning and land use designations, as discussed in Section 3.2 of the technical memorandum and shown on the figures included in that section. Therefore, although agriculture currently occurs in

nearby off-site areas, it is anticipated that this use will gradually diminish and eventually disappear from parcels closest to the site

Use of off-site areas as ecological reserves is considered improbable because of the disturbed nature of most parcels (cultivation or heavy grazing) and the proximity to planned commercial/industrial or mixed commercial/residential uses. Exceptions might be stands of cottonwoods near Standley Reservoir, where bald eagles were observed in the winter of 1992-93

Future on-site land uses considered to be credible include commercial/industrial, recreational, and ecological reserve. Commercial/industrial uses would be appropriate, at least for the present industrialized area of RFP, because of the existing infrastructure, economic advantages, and reduced liability concerns. On-site recreational and ecological reserve would be consistent with the ecological diversity and scenic quality of the site, the existing wildlife use and presence of several species of special concern, the increasing regional interest in habitat preservation and undeveloped recreation, and minimal liability issues.

Credible future off-site uses include commercial/industrial, residential, and recreational. All these are consistent with recent growth and development patterns in the northwestern Denver metropolitan area and are projected in various planning documents (see Section 3.2)

DOE S-2. Section 2.5.3, p. 2-11, second paragraph

Comment If the seeps along the Walnut Creek drainage are currently being remediated, it is unclear why their contribution to surface water contamination would be included in the risk assessment. Please explain further.

Response It was incorrectly stated in the technical memorandum that seeps are currently being remediated. Seeps are actually only being treated. The source of seep contamination is not being addressed.

DOE S-3: Section 2 5 4, p 2-12

Comment The discussion of the use of ground water from the upper hydrostratigraphic unit (UHSU) (or equivalent off-site units) and in the alluvium of the Walnut and Woman Creek drainages needs to be expanded either here or in the land-use sections. There needs to be a specific statement on whether the UHSU is capable of yielding sufficient water for domestic or drinking purposes and whether that water is potable. This statement is needed to support the inclusion or exclusion of an on-site future residential drinking water scenario (Section 4 5 2 6). While there are apparently no wells currently screened in the alluvium of the creek drainages, the possibility of future wells needs to be assessed to support the contention that off-site ground water will not be used in the future for domestic or drinking purposes.

Response The No. 1 sandstone that is connected hydraulically to the alluvium can support a residential well. The groundwater in the alluvium and colluvium is not sufficient to support a domestic well.

DOE S-4: Section 4 5, p 4-5, second paragraph :

Comment Recommend that the significant/insignificant terminology be dropped. Please see General Comment.

Response The purpose of the designations was to eliminate incomplete exposure pathways from the risk assessment, to qualitatively address negligible pathways, and to quantitatively evaluate significant or insignificant pathways.

DOE S-5: Section 4 5 1, p 4-6, fourth paragraph

Comment With the possible exception of dilution in ambient air, the arguments in this paragraph for excluding inhalation of volatile organic compounds (VOC) in outdoor air should also apply to indoor air. Recommend that inhalation of indoor VOCs be deleted as a pathway of concern on this basis. If this deletion is not possible, please revise the paragraph to emphasize the dilution argument for outdoor air.

Response Dilution of indoor air containing VOC's volatilized from subsurface soils through a foundation does not occur to the same extent as outdoor air prior to the exposure point in a closed building. The paragraph will be revised for clarity.

DOE S-6: Section 4 5 1, p 4-6, fifth paragraph

Comment This paragraph is inconsistent with the inclusion of ground water ingestion as a complete future on-site exposure pathway (Table 4-1 and Section 4 5 2 6) and with the assumed contribution of ground water to concentrations of indoor VOCs. Please see also Specific Comment Number 3.

Response Direct ingestion of groundwater does not involve volatilization of VOCs to outdoor air. Exposure to indoor air VOCs from groundwater is not addressed in this paragraph which discusses volatilization to outdoor (ambient) air.

DOE S-7: Section 4 5 2, p 4-7 to 4-19

Comment This section contains much repetitive material. For example all 6 subsections begin with the same sentence listing potential chemical release mechanisms, and restates in each subsection that ground water and storm runoff contribute to surface water contamination. Suggest that the chemical release mechanism and the general potential pathway discussions

be done once at the beginning of Section 4.5 and that the 4.5.2 subsections simply state why particular pathways are included or excluded for a given scenario

Response: Conceptual site models (Figure 4-1) are a challenge to explain, and it is believed that the current explanation is sufficient

DOE S-8: Section 4.5.2.1, p. 4-8, second paragraph

Comment: The implication that dermal absorption is relatively insignificant with respect to ingestion for soils is incorrect. Risks associated with the two exposure routes for soils are comparable

Response: It is believed that the relative significance of the two exposure routes is correct as stated, however, we intend to assess both the significant and insignificant exposure routes quantitatively

DOE S-9: Section 4.5.2.1, p. 4-8, third paragraph

Comment: It is unclear why radionuclides should be excluded from consideration based on expected low concentrations. Radionuclides are the only contaminants for which historical evidence exists for significant wind dispersion. Please explain.

Response: Radionuclide exposure to off-site residents will be addressed in the revised technical memorandum due to the relatively high source term in surface soils at OU 2

DOE S-10: Section 4.5.2.1, p. 4-9, first and second paragraph

Comment: The arguments against considering plant uptake from soils are not correct. The first bullet limits the discussion to metals when there is no basis for excluding organic compounds. The statement in the next paragraph that intake from ingestion and dermal contact will greatly exceed the intake is

incorrect, for organic compounds intake from plant ingestion usually exceeds intake from soil ingestion or dermal contact by an order of magnitude or more. Recommend that plant uptake from soils be carried through the Risk Assessment.

Response It is believed that estimating risk due to plant uptake off-site is unreasonable because of the extreme dilution associated with aerial transport and mixing throughout the root zone. Conservative estimates of dilution as a result of Gaussian dispersion to an off-site garden, couple with tilling of the top 15 cm of the garden soil, result in a dilution factor of at least 60,000 following 30 years of deposition. Dilution due to Gaussian dispersion is estimated to result in an annual deposition rate of less than 100 mg/m² of OU 2 particulates on garden soil at the location of the off-site residential receptor. This value is conservative, because the model actually predicts this deposition rate at a distance of one mile from the source. Using a tilling depth of 15 cm and a soil density of 1.2 g/cm³ results in a total dilution factor of at least 1.8 million for each year's deposition. Assuming that aerially deposited contaminants accumulate at the same rate for a period of 30 years yields a total dilution factor of at least 60,000. Of course, the use of soil amendments would result in further dilution. Therefore, the additive exposure associated with plant uptake from the soil (compared to deposition of foliar parts) is insignificant.

DOE S-11 Section 4.5.2.3, p. 4-12, fifth paragraph

Comment The statements in the first sentence concerning the significance of scenarios and exposure routes are incorrect. Direct contact with soils would be expected to be more significant for construction workers, who may be in intimate contact with soils during excavations, than for office workers, and intake via dermal contact and ingestion are comparable. Again, recommend that such statements be dropped.

Response The text is incorrect as written, "significant" and "insignificant" were inadvertently switched

DOE S-12: Section 4.5.2.4, p 4-13, third paragraph

Comment For surface water, exposure via dermal contact is usually much more significant than incidental ingestion, contrary to what is stated here. Given the intermittent nature of the streams and the fact that the ecological researcher would be highly unlikely to be swimming, incidental ingestion would be expected to be negligible in this case. The statements on relative significance should be dropped or corrected. In addition to dermal contact with water, dermal contact with sediments could be an important exposure route. Recommend that this exposure route be added to the Risk Assessment.

Response This would be true for the ecological researcher. The statements on significance will be corrected. Dermal contact with sediments is addressed for the ecological researcher and future on- and off-site residents (see Figure 4-1).

DOE S-13: Section 4.5.2.4, p 4-13, top of page

Comment Please see Specific Comment Number 5.

Response See response to specific Comment Number 5.

DOE S-14: Section 4.5.2.5, p 4-15, second paragraph

Comment Given the intermittent nature of the streams and the difficulty of access, it would appear highly unlikely that residents would have significant exposure to the creeks. Recommend that this exposure pathway be deleted for the residential scenario. See also Specific Comment Number 12.

Response Exposures to surface water and sediments will be addressed for future residents only, due to the assumption that there will be no control of stormwater in the future. There is not significant exposure to the creeks. The EF is equal to only 18 hours/yr.

DOE S-15: Section 4.5.2.5, p. 4-15, third paragraph

Comment The fact that there are currently no domestic wells in the alluvium of the Woman Creek and Walnut Creek drainages does not preclude future domestic wells in those locations. Arguments against the future use of ground water off site need to be based on the hydraulic nature of the geological units or the quality of the water. Please see also Specific Comment Number 3.

Response Please see response to Specific Comment Number 3.

DOE S-16: Section 4.5.2.5, p. 4-16, second and third paragraph

Comment Material is repeated verbatim from an earlier section. Please see Specific Comment Number 10.

Response The text will be revised as described in the response to specific Comment Number 10.

DOE S-17: Section 4.5.2.5, p. 4-16, fourth paragraph

Comment Material is repeated verbatim from an earlier section. Please see Specific Comment Number 9.

Response The text will be revised as described in the response to Specific Comment Number 9.

DOE S-18: Section 4.5.2.6, p 4-17, fourth paragraph

Comment Please discuss the evidence that the hydraulic properties of the UHSU are suitable for domestic wells. Please see also Specific Comment Number 3. In addition, if the unit is suitable for drinking water wells, water from the unit would probably also be used for other domestic purposes such as bathing. If ground water ingestion is considered a complete pathway, dermal contact and inhalation of VOCs should be added as complete pathways.

Response See response to Specific Comment Number 3. Inhalation of VOCs volatilized from UHSU groundwater is addressed for the future on-site resident (see Figure 4-1). Dermal contact is typically insignificant compared to groundwater ingestion.

DOE S-19: Section 4.5.2.6, p 4-18, second paragraph

Comment For organic compounds intake from plant ingestion usually exceeds intake from soil ingestion or dermal contact by an order of magnitude or more. Please correct the statements to the contrary in this paragraph.

Response Comment noted. Text will be revised.

DOE S-20: Section 5.0, p 5-2, top of page

Comment The units in the equation are correct only for water or air. Units for soil or plants are usually mg/kg and mg/day for concentration and ingestion rate, respectively. Since all units are given in the tables, this equation could be deleted. Please correct or delete.

Response Comment noted. The equation is intended for explanation of units only.

DOE S-21: Section 5.1.5, p. 5-8, first paragraph

Comment Both the ingestion rate and the exposure frequency used for the surface water pathway are generally considered appropriate for swimming. Given the nature of the creeks, it seems unlikely that either an ecological worker or a resident would be immersed in the creeks. Suggest that the ingestion rate be lowered or that the ingestion pathway be deleted altogether since it is unlikely to be important. The exposure frequency is probably reasonable but should be considered a site-specific variable not referenced to Environmental Protection Agency (EPA) 1989a. Please see also Specific Comment Numbers 12 and 14.

Response Agreed. The lack of available information on this activity pattern resulted in a conservative extrapolation of wading to swimming. Typically, ecological research would involve a combination of periodic field work coupled with extensive time in the library, office, or laboratory. This work includes reviewing existing literature, compiling the raw data, performing statistical analyses, preparing tables and graphics, and writing text. Recently, Dr. Ward Whicker of Colorado State University, who has performed extensive ecological research at RFP, estimated that a reasonable estimate for a typical researcher at OU 2 would include field work for 4 hours per day, 13 weeks per year, over a period of 2.5 years.

DOE S-22: Section 5.1.7, p. 5-10, first paragraph

Comment The exposure frequency and exposure time are probably reasonable but should be considered site-specific variables not referenced to EPA 1989a since that document assumes a swimmer scenario. Water permeability constants for most organic chemicals are given in Dermal Exposure Assessment: Principles and Applications (EPA 1992) or can be calculated from empirical formulas; there is no need to reference a single default value as is done here. Please see also Specific Comment Numbers 12 and 14.

Response Chemical-specific permeability constants, if available, will be determined from appropriate, current literature. This information will be submitted for review and approval prior to inclusion in the Toxicity Assessment Technical Memorandum. EPA and CDH will have an opportunity to review the methodology and specific values to be used at the time